

University of Groningen

## A Scientific Visualization and Computational Steering Environment

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**Scientific Visualization** encompasses the processes of exploring, transforming, and viewing scientific data as images, in order to get a better insight into the data.

**Computational Steering** (CS) strives to merge the data generation and visualization stages in a single process where the user can interactively control the simulation phase as well as the processing, exploration and analysis phase. Steering systems aim ultimately to be general-purpose environments for specification and parameter control for both the simulation and the visualization stages.

**Simulation Libraries** provide computational tools for various application domains. A generic CS environment should easily integrate such libraries and provide inter-library data communication transparently.

Custom Code

Integration

Simulation  
Editing

Parameter  
Editing

Visualization

We have designed an **Object-Oriented Scientific Visualization and Computational Steering Environment** which extends the concepts and power of systems as AVS/Express, Explorer or Khoros with object-oriented concepts present in systems like Oorange, vtk, or Open Inventor. We address all the requirements of a generic steering tool:

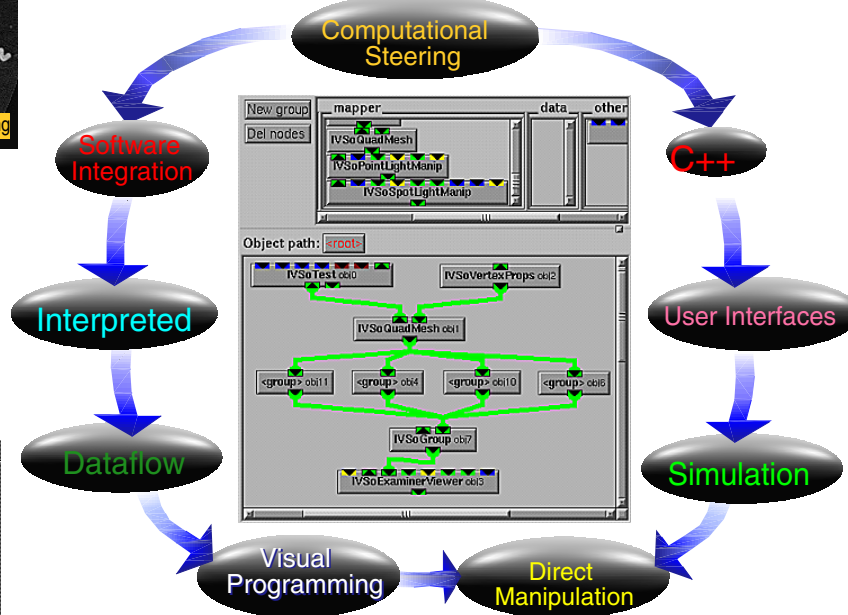
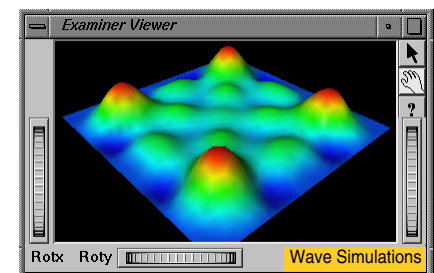
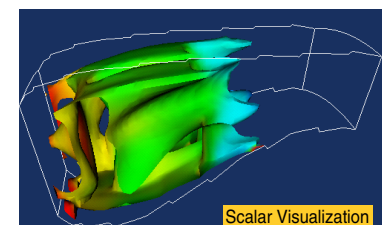
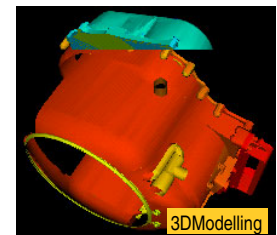
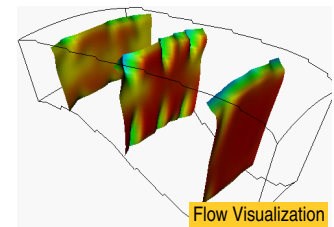
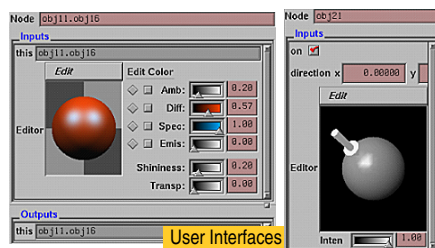
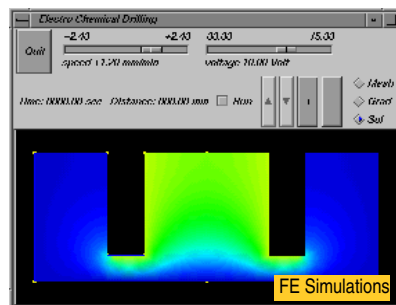
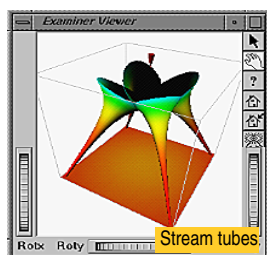
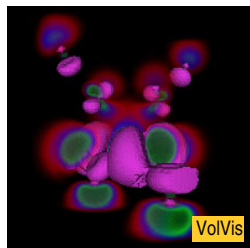
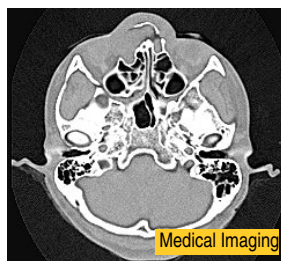
**Extensibility:** easy integration of user-written C++ libraries

**Interactivity:** GUI widgets for all simulation/visualization stages are automatically constructed

**Dataflow:** simulations are visually specified as a module network driven by an extended OO dataflow manager. Loops can be created to naturally describe iterative processes.

**Command:** the system interprets C++ code interactively

**Persistence:** networks are saved as pure C++ source code so inter-system simulation transport is easy.



## System Architecture:

**OO Foundation:** C++ compiler interpreter merge  
**OO Dataflow:** the metaclass concept, enhances C++ with dataflow semantics.

